# A plan for the VLTI

Grenoble - 15/16 January 2014

# 2 Timescales

- Preparing for GRAVITY and MATISSE
- VLTI in the ELT Era (ESO VLT White book)

# Requests

- Prepare the infrastructure for GRAVITY and MATISSE
- Improve VLTI performance:
  - Robustness to weather conditions: adaptive optics on ATs (NAOMI)
  - Robustness to vibrations in the UTs: active vibration control strongly recommended by STC
  - Sensitivity and spectral resolution: provide fringe tracking
- Improve the access to the VLTI community:
  - Science ready pipelines: ESO deliverables
  - Phase 3 (science ready) data product repository: ESO repository (JMMC repository: OIDB).
  - Production of phase 3 products by ESO: not resourced
  - Providing reconstructed images: community
  - Promoting the use of VLTI: community (ESO)

# An important effort

| NOW | Status |
|---|---|
| MIDI | Removed in P94 |
| PIONIER | Removed in P94 |
| AMBER | Stays until: |
| FINITO | Stays if AMBER stays |
| NAOMI | PDR end of 2014 ? |
| VIBRATION | No project yet |
| GRAVITY | PAE + shipment end of 2014 |
| MATISSE | GRAVITY + 1yr ? |
| PRIMA | Decision February 2014 |
| 2GFT | Delayed 2016 ? |

**Need for a holistic technical implementation plan**

# Details

- PRIMA-Astrometry:
  - Commissioning process interrupted 2011;
  - Switched to “engineering mode” to enable “experimental” astrometry and evaluate performance;
  - Conclusion of engineering period: system as designed can’t deliver the requested performances for science case. Need an improved baseline calibration.
  - Gate review principle endorsed by ESO management and approved by STC: 29/30 january
    - Non-ESO board;
    - Validity of PRIMA recovery plan evaluated (technical, resources, managerial)
    - Pertinence of science case in the exoplanet context.
  - Based on review, the ESO management will take the decision to continue or not PRIMA-Astrometry

# Details

- PIONIER:
  - Recommended by STC, principle of its extension approved by Paranal director pending status clarification and agreement with IPAG.
  - Technical solution to relocated PIONIER proposed by Paranal: no resources.
  - Phase 1: If implemented will remain one/two years with current status.
  - Phase 2: Service mode ?
  - Phase 3: Upgrade (J, medium resolution)?

# Details

- AMBER
  - Can stay after the lab modification;
  - Aging instrument
  - Drop in number of night requested (end of its life as it is ?)
  - Will it be competitive at the time GRAVITY comes is offered?
  - Spot could be used for J,H + 4T + spectral resolution ?
  - What do we do with AMBER ?

# Details

- NAOMI: PDR in view (end 2014) slow pace
- Vibrations control: Identified as priority by STC. Currently no formal project at ESO
- 2nd generation fringe tracking: Postponed to 2016. Serious problem for MATISSE.

# The future of VLTI

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# VLTI strengths

- The best angular resolution accessible in Europe (for a long time);
- After a huge investment it is finally working well
- AT sub array
- Two new instruments coming;
- ESO (service mode, archives, maintenance, stability)
- An untapped potential in the study of stellar environments and AGN;
- An untapped potential in the study of multiplicity (massive stars, brown dwarf, ysos)
- An untapped potential in the study of temporal variability (ysos, novae, evolved stars Bes)
- An untapped potential for creativity (GRAVITY)?

# VLTI strengths

- Workhorses topic that appear in almost all prospective exercices e.g Astronet, NASA, US decadal (YSOs and AGNs) with growing interests from the community.
- A very active community, well organized (schools, EII ...)
- A unique potential for community growth (e.g PIONIER days)
- Entire bandpasses unexplored (can be opened for 1Meuro);
- JMMC: a community center that develops useful software for the community with high reactivity.
- An untapped potential of synergy with ALMA
- Optical interferometry is a serious contender to become the post-ELT ground based optical facility (ok we are speaking about decades ...)

# VLTI weaknesses

- The community is small and partly interferocentric;
- The accessibility to reduced data is a problem (prebiscit of PIONIER's black box + service package): 10 years after this is a problem.
- Long-baselines lacking: deficit of resolved stellar surfaces
- The funding context (ELT) is hostile
- ESO lack of flexibility
- The ESO current organisation context (no more Paranal VLTI, probably no more Garching VLTI) weakens the possibility to develop the VLTI in a holistic way (fragmentation)

# Plans for the future

- Make GRAVITY and MATISSE a success
- Construct a real lobbying power (science based)
- Need for the presence of the VLTI in the VLT whitebook ("VLT in the ELT era" status not clear)
- Explore ways to accompany the VLTI user:
  - ARC-like center ? JMMC, EII funding
- High dynamic binary explorer (4T, L band (nulling?), precision closure phase)
- J, H with medium resolution imager (molecular bands in cool atmospheres, envelops, Paschen Beta spatially resolved mass accretion/mass loss, radius-luminosity )
- Very high spectral resolution in the visible, 4T: link with asteroseismology?,
- 6 telescope imager? limitations in imaging power clearly visible, the necessity to tackle temporary varying processes.
- Heterodyne interferometry at Paranal ?

# A POSSIBLE roadmap

- 2014: Start community discussion on VLTI “nodes”? (EII)
- 2015: Stellar physics 2.0 workshop (short wavelengths oriented) with VLTI whitebook in mind?
- 2016: removal of AMBER
- 2016: decision on fringe tracker solution
- 2018: decision on PIONIER++ (J,H Medium resolution)
- 2018: decision on Binary Hunter (BROWNIE)
- 2020s GRAVITY/MATISSE return of experience in imaging: should we go 6T?

# Discussion

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# Questions ?

- **Period 94 shutdown tbc**
- What should we do with AMBER?
- **How does the community structures itself (inspiration from ALMA?):**
  - to interact with ESO (e.g: future of operations,decision on AMBER)
  - to prepare accompany GRAVITY and MATISSE: ARC (?)
    - Xavier Haubois (JMMC)
  - What European initiatives ?
- How to you see the future of VLTI ?
  - A possible Roadmap:
    - 2014: Start community discussion on VLTI “nodes”? (EII)
    - 2015: Stellar physics 2.0 workshop (short wavelengths oriented) with VLTI whitebook in mind?
    - 2016: removal of AMBER
    - 2016: decision on fringe tracker solution
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    - 2020s GRAVITY/MATISSE return of experience in imaging: should we go 6T?
  - Connexion with PFI ?